

DOCKET NO. **SA- 516**

EXHIBIT NO. **12-A**

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C**

**GROUP CHAIRMAN'S FACTUAL
REPORT OF INVESTIGATION
COCKPIT VOICE RECORDER**

**FACTUAL REPORT OF INVESTIGATION
COCKPIT VOICE RECORDER**

by

James R. Cash
Electronics Engineer

WARNING

The reader of this report is cautioned that the transcription of a CVR tape is not a precise science but is the best possible product from a NTSB group investigative effort. The transcript, or parts thereof, if taken out of context can be misleading. Therefore, the attached CVR transcript should only be viewed as an investigative tool to be used in conjunction with other evidence. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C. 20594

October 20, 1997

Group Chairman's Factual Report of Investigation
Cockpit Voice Recorder

DCA-96-MA-070

A. ACCIDENT

Location: East Moriches, New York
Date: July 17, 1996
Time: 3031:12 Eastern Daylight Time
Aircraft: Trans World Airlines Inc.
Boeing 747-100 N93119

B. GROUP

Chairman: James R. Cash
Electronics Engineer
National Transportation Safety Board

Member: Dale Ranz
Chief 747 Engineering Pilot
Boeing Commercial Aircraft Co.

Member: James Ryan
Supervising Special Agent
Federal Bureau of Investigation

Member: Harold D. Spain
Captain
TWA Inc.

Member: Lyle Streeter
Air Safety Investigator
Federal Aviation Administration

Member: Al Weaver
Accident Investigator
Pratt&Whitney Aircraft

Member: Gene York
Captain
Airline Pilots Association

C. SUMMARY

A Fairchild model A-100 cockpit voice recorder (CVR) s/n UNK was brought to the audio laboratory of the National Transportation Safety Board. A transcript was prepared of the entire 31½ minute good⁰ quality recording. (attached)

D. DETAILS OF INVESTIGATION

The CVR unit arrived in the lab in a large cooler still submerged in water. The exterior of the CVR was extremely dented and distorted. The front panel of the CVR was ripped from the unit and was only being held on by the underwater locating beacon mount. The normal carrying handle was missing. The data plate that is normally attached to the front panel was also missing and never recovered.

The protective dust cover had to be cut in several places before it could be removed. The interior crash enclosure appeared to be in good condition. There were only a few minor scratches and dents noted. The interior tape reel assembly was wet. Several small thin plastic reel pieces were broken off and were found loose inside of the enclosure. The recording media was wet but otherwise appeared to be in good condition. The tape was not broken or physically damaged from the accident. There were no signs of any fire or heat damage noted to either the exterior or the interior of the unit. The Dukane underwater locator beacon that

was installed on the CVR was slightly dented and scratched but operated normally when tested in the lab.¹

The recording consisted of four channels of good quality audio information. One channel contained the cockpit area microphone audio information. The other three channels contained the Captain's, the First Officer's, and the Second Officer's radio/intercom information.

The recording starts at 1959:40 EDT and continues uninterrupted until 2031:12 EDT when electrical power was removed from the unit. When the recording starts, the Kennedy gate agent is in the cockpit telling the crew that they are ready for departure. The aircraft's door is closed and the crew request push-back from the gate at 2001:42 EDT. During the push-back and before taxi the crew starts the number 1,2,and 4 engines. The flight contacts ground control at 2008:13 EDT and requests taxi clearance. During the taxi the crew starts the number 3 engine at 2014:29 EDT. The flight is cleared for takeoff on runway 22 right at Kennedy at 2018:21 EDT.

The takeoff and climb appear normal. The flight contacts Kennedy departure control at 2020:14 EDT. They are subsequently turned over to Boston Center at 2023:37 EDT. Boston Center instructs the crew to continue their climb and maintain fifteen thousand feet at 2030:15 EDT. The acknowledgment of this transmission at 2030:19.2 EDT is the last radio transmission received from the aircraft. The recording stopped at 2031:12 EDT.

James R. Cash
Electronics Engineer

¹The Beacon was returned to Dukane Corporation, the manufacturer, for a post accident evaluation of its operation. See addendum report.

TRANSCRIPT OF A FAIRCHILD MODEL A-100 COCKPIT VOICE RECORDER
S/N UNK WHICH WAS REMOVED FROM A TRANS WORLD AIRLINES, INC.,
BOEING COMMERCIAL AIRCRAFT CO. B747-100 N93119, WHICH WAS
INVOLVED IN AN INFLIGHT ACCIDENT ON JULY 17, 1996
APPROXIMATELY 10 MILES SOUTH OF EAST MORICHES, NEW YORK.

RDO	Radio transmission from accident aircraft
CAM	Cockpit Area Microphone sound or source
INT	Aircraft flight/ground intercom sound or source
-1	Voice identified as Captain (left seat)
-2	Voice identified as First Officer (right seat)
-3	Voice identified as Second Officer
-4	Voice identified as Instructor Flight Engineer
-5	Voice identified as gate agent personnel
-6	Voice identified as male aircraft ground personnel
-?	Voice unidentified
TWR	JFK Local Controller (tower)
GND	JFK Ground Controller
DEP	New York Radar Departure Controller
CTR	Boston ARTCC Controller (center)
FIC	TWA Flight Information Controller
GH	Kennedy Gate Hold Controller
LOAD	TWA passenger/freight load Controller
ATIS	Kennedy automated terminal information service
UNK	Unknown source

* Unintelligible word
@ Nonpertinent word
Expletive deleted
% Break in continuity
() Questionable text
(()) Editorial insertion
- Pause

Note: All times are expressed in Eastern Daylight Savings time. Only radio transmissions to and from the accident aircraft were transcribed.

⁰ CVR Quality Rating Scale

The levels of recording quality are characterized by the following traits of the cockpit voice recorder information:

Excellent Quality	Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous cockpit/radio transmissions that obscure each other.
Good Quality	Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous cockpit/radio transmissions that obscure each other.
Fair Quality	The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by cockpit noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the CVR system that distorts or obscures the audio information.
Poor Quality	Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high cockpit noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the CVR system that severely distorts or obscures the audio information.
Unusable	Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the CVR system.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
1959:40	Start of recording.
1959:41 CAM-?	got it.
1959:42 CAM-?	an agent comin'.
1959:43 CAM-?	yeah right.
1959:44 CAM-5	passenger's bag pulled, the passenger was on board the whole time.
1959:49 CAM-5	all right.
1959:50 CAM-1	is the bags back on?
1959:52 CAM-5	huh?
1959:53 CAM-?	yes.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
1959:53 CAM-1	yeah he was on the whole time.
1959:54 CAM-1	okay.
1959:56 CAM-4	are we reconciled?
1959:56 CAM-?	let's go.
1959:58 CAM-?	push.
1959:59 CAM	((sound similar to cockpit door closing)).
2000:01 CAM-1	we won't bother telling them that.
2000:03 CAM-?	nope.
2000:04 CAM-1	you don't mind, huh?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2000:11 CAM-3	we'd have a mutiny back there.
2000:14 CAM-4	now the lavatories are full.
2000:15 CAM-1	okay, well she said she'd call me as soon as they ah --.
2000:16 CAM-3	probably have to get the ATIS now, huh?
2000:18 CAM-2	don't don't ah let them do their job Ralph they'll tell you when they're seated.
2000:22 ATIS	-- visibility greater than one zero ceiling better than five thousand temperature two eight due point two one altimeter three zero zero seven approach in use VOR DME runway two two left departure runway runway two two right and southwest departures runway three one left from intersection of kilo kilo all pilot are require to read back all runway hold short instructions in interest of noise abatement please use the assigned runway advise you have tango Kennedy airport information tango two three five one Zulu weather wind two two zero eight visibility --.
2000:36 CAM-3	all door lights are out.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2000:37 CAM-1	thank you.
2000:53 CAM-2	tango.
2001:18 CAM	((sound of cabin chime)).
2001:23 CAM-3	hello darling.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2001:02 INT-6	cockpit ground.
2001:05 INT-1	hello ground
2001:06 INT-6	all right every thing is shut down here you should have all door lights out and when you have clearance you can release the brakes.
2001:13 INT-1	yeah we'll get the clearance we're waitin' on all the people to sit down I'll be back with ya in just a second.
2000:40 INT-6	okay we're standing by.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2001:24 CAM-3	everybody seated thanks.
2001:25 CAM-1	amazing.
2001:26 CAM-3	everybody's seated.
2001:27 CAM-1	do we have push back clearance to move?
2001:28 CAM-3	we're we're we cleared to push from FIC or -.
2001:30 CAM-1	no not yet.
2001:31 CAM-2	you have to call them.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2001:32 RDO-3	FIC TWA eight hundred gate twenty seven.
2001:37 FIC	TWA eight hundred?

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2001:39
CAM ((sound of electric seat adjustment)).

2001:46
CAM-2 cleared to push.

2001:47
CAM-1 cleared to push.

2001:53
CAM-1 did they say everybody was seated yeah they did.

2001:54
CAM-3 yes.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2001:38
RDO-3 yeah we're ready to push.

2001:42
FIC TWA eight hundred you're cleared to push gate twenty seven.

2001:48
RDO-3 cleared to to push eight hundred.

2001:50
INT-1 okay ground we are cleared to push yeah well wait a minute hang on a minute.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2001:58
CAM ((sound similar to parking brake being released)).

2002:02
CAM-2 you got something else to do Ralph.

2002:05
CAM-1 number one ADP-.

2002:06
CAM-2 there you go.

2002:07
CAM-1 and the electric.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2001:58
INT-1 okay, we're cleared to push sorry.

2001:57
INT-6 brakes released please.

2001:59
INT-1 beacon on brakes released.

2002:00
INT-6 thank you.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2002:08 CAM-2	it's a command.
2002:09 CAM-1	electric's on.
2002:10 CAM-2	right.
2002:10 CAM-2	that's a command.
2002:11 CAM-1	command.
2049:27 CAM-1	number one ADP on and the electric.
2002:16 CAM-2	before you release the brakes.
2002:22 CAM-?	*.
2002:27 CAM-2	block's at oh two I assume.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2002:29 CAM-3	I'm showin' oh two out. is that what you want?
2002:32 CAM-2	that's fine.
2002:33 CAM-1	yeah.
2002:34 CAM-2	that's fine.
2002:35 CAM-1	okay.
2002:38 CAM-2	that's a minute over kill.
2002:40 CAM-1	yeah well that was because they weren't seated they probably had people standing up and they were *.
2002:46 CAM-2	* down.
2002:48 CAM-2	exactly.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2002:50 CAM-1	you can bet on it.
2002:54 CAM-1	I still think I'm sittin' too high in this thing.
2003:11 CAM-1	somebody calling us .

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2003:10 FIC	eight hundred.
2003:12 RDO-3	go ahead.
2003:13 FIC	tell your mechanic to pull you back push you back far enough so we can get an arrival into your gate.
2003:18 RDO-3	okay.
2003:21 INT-1	and ah ground FIC wants you to push us back far enough so they can bring somebody in our gate.
2003:27 INT-6	okay we'll do that.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2003:32
CAM-? * where's this thing.

2004:07
CAM-1 ah there's that ah new airplane.

2004:10
CAM-2 one twenty nine yes sir.

2004:48
CAM ((sound of parking brake being set)).

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2003:30
INT-1 thank you.

2004:43
INT-6 okay this looks far enough.

2004:45
INT-1 okay if you say so.

2004:47
INT-6 brakes parked please.

2004:50
INT-1 brakes parked.

INTRA-COCKPIT COMMUNICATION

TIME and
SOURCE

CONTENT

2004:59
CAM-1 turn one please.

2005:12
CAM-2 ((sound of cough)).

2005:19
CAM-1 contact.

2005:22
CAM-2 you got N-1?

2005:26
CAM-1 I do now.

2005:27
CAM-2 you do now.

AIR-GROUND COMMUNICATION

TIME and
SOURCE

CONTENT

2004:51
INT-6 thank you cleared to turn your engines.

2004:54
INT-1 okay we'll turn one two and four today.

2004:56
INT-6 ((sound of two mike clicks)).

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2005:29 CAM-3	four fifty.
2005:30 CAM-1	it bobbled but not much.
2005:42 CAM-1	and turn two please.
2005:44 CAM-4	***.
2006:00 CAM-1	N-one.
2006:01 CAM-3	turning.
2006:04 CAM-1	two.
2006:07 CAM-3	four hundred.
2006:24 CAM-1	turn four.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2006:25 INT-1	turning four.
2006:27 INT-6	* four.
2006:45 CAM-1	contact.
2006:51 CAM-3	four hundred.
2007:13 CAM-1	okay and after start checklist when you have a moment.
2007:14 CAM	((sound of momentary power interruption to the CVR)).
2007:15 CAM	((sound of altitude alert tone)).

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2006:56 INT-1	disconnect ground equipment stand by for hand signals thank you.
2006:58 INT-6	okay.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2007:20 CAM-3	stand by.
2007:29 CAM-1	after start.
2007:30 CAM-3	after start checklist. flight recorder?
2007:33 CAM-1	on.
2007:34 CAM-3	start switches?
2007:35 CAM-1	off.
2007:36 CAM-3	beacon lights?
2007:37 CAM-1	are on.
2007:38 CAM-3	brake pressure?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2007:41 CAM-1	checked.
2007:42 CAM-3	start levers?
2007:44 CAM-1	idle detent.
2007:45 CAM-3	engine anti-ice?
2007:46 CAM-1	off.
2007:50 CAM-1	you need to get taxi clearance.
2008:04 CAM-3	after start checklist complete.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2007:52 RDO-2	Kennedy gate hold TWA's eight hundred heavy we're lifeguard ah we're ready to taxi out delta alpha with tango.
2008:01 GH	TWA eight hundred all right contact ground one two one point niner for the taxi inform them that you are lifeguard.

INTRA-COCKPIT COMMUNICATION**TIME and
SOURCE****CONTENT****AIR-GROUND COMMUNICATION****TIME and
SOURCE****CONTENT**

2008:07

RDO-2 roger.

2008:13

RDO-2 Kennedy ground TWA's eight hundred heavy lifeguard comin' out delta alpha with tango.

2008:19

GND ah TWA eight hundred heavy ah you're a life guard today?

2008:24

RDO-2 yes sir.

2008:25

GND you know every day you come out and we don't know that you're a lifeguard and then you tell us you are and ah if you could tell company to ah you know ah put that in their flight plan ah it would help us out alot.

2008:38

RDO-2 TWA's eight hundred understand I don't think they knew it either until the last minute.

2008:41

GND all right TWA eight hundred taxi right on alpha and hold short of echo.

2008:47

RDO-2 TWA's eight hundred right alpha hold short of echo.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2008:52
CAM-1 right on alpha and hold short of echo.

2008:53
CAM-1 clear right?

2008:54
CAM-2 clear right.

2008:55
CAM ((sound of parking break being released)).

2008:57
CAM-2 clear left.

2009:19
CAM-2 watch number one it's too high.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2008:49
RDO-3 and a load TWA eight hundred.

2009:05
RDO-3 and load TWA eight hundred.

2009:07
LOAD eight hundred stand by.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2009:26 CAM-1	forty five percent.
2009:28 CAM-1	you got a guy over there.
2009:30 CAM-2	yup.
2009:34 CAM-1	right on alpha huh?
2009:41 CAM-1	clear.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2009:36 LOAD	eight hundred ready to copy?
2009:37 RDO-3	ready to copy.
2009:38 LOAD	on board twenty nine up front one eight three in the rear takeoff fuel is one seven six decimal six your gross takeoff weight is five nine zero seven seven one trim six decimal one and no reported GSI's. copy?

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2009:42 CAM-2	yeah.
2009:43 CAM-2	keep it comin'.
2009:51 CAM-1	does he look clear?
2009:52 CAM-2	yup it's no problem.
2010:01 CAM-1	one two three --.
2010:09 CAM-1	ya think he's gunna try and get us out being a lifeguard?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2009:56 RDO-3	okay twenty nine in the front one eighty three in the back one seven six decimal six on the fuel five nine zero decimal seven seven one on the takeoff weight six point one on the trim and no GSIs TWA eight hundred out.
2010:10 LOAD	okay read back. * both times?

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE

CONTENT

2010:15
CAM-2 I think he just *.

2010:19
CAM-2 that's your undershoot problem huh.

2010:21
CAM-1 * it is
?

2010:26
CAM-1 how's that look?

2010:27
CAM-2 better.

2010:50
CAM-3 six point one on the trim.

2010:53
CAM-2 okay set up here.

AIR-GROUND COMMUNICATION

TIME and SOURCE

CONTENT

2010:12
RDO-3 yeah we're out at ah zero zero zero two and ah expecting off here
probably about ah thirty five.

2010:24
LOAD copy zero two and three five have a good flight eight hundred.

2010:25
RDO-3 see ya.

INTRA-COCKPIT COMMUNICATION

TIME and
SOURCE

CONTENT

2011:58
CAM-1 well we lost a little bit of weight huh? payload.

2012:24
CAM-1 left on echo behind carnival hold short of three one right.

2012:35
CAM-2 ((sound of cough)).

2012:38
CAM ((sound of parking brake release)).

2012:41
CAM-2 can I have the weight slip if you are done with it, Ollie?

2013:22
CAM-2 notice that's going to be an undershoot too.

AIR-GROUND COMMUNICATION

TIME and
SOURCE

CONTENT

2012:04
GND TWA eight hundred make a left turn on um taxi way echo behind Carnival and hold short of runway three one right and you can monitor tower now on one two three point niner.

2012:17
RDO-2 TWA's eight hundred heavy left echo hold short of three one right over to the tower, bye.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2013:24 CAM-1	what's that?
2013:25 CAM-2	good.
2013:27 CAM-1	well then someone's given me the wrong poop cause I was tryin' to turn like on the L ten eleven they said I was over-turning.
2013:33 CAM-2	ah.
2013:38 CAM-1	how much past center then?
2013:40 CAM-2	nose wheel is back by the emergency exit door. right?
2013:42 CAM-1	right, right.
2013:45 CAM-?	(sound of cough).

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2013:41 TWR	and lifeguard TWA eight hundred heavy Kennedy tower good evening you with me?

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2013:46 CAM-2	so you really can't start the turn until the nose wheel is past there the center taxi line and whatever it takes as far as -.
2013:54 CAM-1	the angle but *.
2013:56 CAM-2	as far as comin' out with the main gear you just want to play with it a little bit a few times to find out.
2014:04 CAM-1	okay.
2014:07 CAM-2	but that first turn would have been a very dirty *.
2014:10 CAM-1	*.
2014:11 CAM-2	there's no way you could - .

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2014:12 TWR	TWA eight hundred heavy lifeguard Kennedy tower.

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE

CONTENT

2014:29
CAM-1 start the number three motor.

2014:31
CAM-2 let's.

2014:33
CAM-2 start taxi.

2014:36
CAM-1 okay.

2014:37
CAM-2 are you ready?

2014:37
CAM-3 okay.

AIR-GROUND COMMUNICATION

TIME and SOURCE

CONTENT

2014:13
RDO-2 TWA's eight hundred heavy lifeguard go ahead.

2014:16
TWR I'm gunna put you behind British Airways so the company heavy seven six knows to follow you so make a right on the runway a left at Zulu alpha and follow British.

2014:23
RDO-2 TWA eight hundred heavy okay right on ah thirty one ah correction thirteen left and follow British.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2014:43 CAM-2	just let me have one engine.
2014:39 CAM-3	there you go.
2014:40 CAM-?	if you need it.
2014:41 CAM-3	all right we got enough pressure.
2014:42 CAM-2	okay here we go I'll get the engine for ya.
2014:53 CAM-2	watch your feet just steer it.
2014:56 CAM-2	just leave 'em alone for a little bit.
2014:58 CAM-1	you want number three back?
2014:59 CAM-2	yup.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2015:01 CAM-2	don't touch the engines.
2015:02 CAM-1	okay.
2015:04 CAM-2	start lever.
2015:08 CAM-3	four hundred.
2015:23 CAM-2	okay you can have 'em now.
2015:29 CAM-2	here you got no problems.
2015:33 CAM-1	delayed engine -.
2015:34 CAM-2	wide runway you don't need to worry about it.
2015:36 CAM-1	yeah delayed engine start.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2015:39 CAM-3	delayed engine start checklist. start switches?
2015:42 CAM-1	off.
2015:43 CAM-3	start levers?
2015:45 CAM-1	idle detent.
2015:47 CAM-3	engine anti-ice?
2015:47 CAM-1	off.
2015:51 CAM-3	delayed engine start checklist is complete.
2015:53 CAM-1	taxi checklist.
2015:55 CAM-3	taxi checklist. Flaps and runway?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2015:58 CAM-1	flaps are ten and green for runway two two right Kennedy.
2016:04 CAM-3	ten eight green two two right Kennedy. take off data EPR and airspeed bugs?
2016:08 CAM-1	five hundred and ninety thousand seven seventy one takeoff EPR's set at point three three bugs set and cross checked at one fifty three.
2016:16 CAM-2	set and cross checked.
2016:17 CAM-3	stabilizer trim?
2016:18 CAM-1	is set at six point one.
2016:21 CAM-3	probe heat?
2016:22 CAM-1	on.
2016:23 CAM-3	flight controls?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2016:25 CAM-1	checked.
2016:26 CAM-3	auto-brakes?
2016:28 CAM-1	armed.
2016:29 CAM-2	now you can start it.
2016:31 CAM-3	yaw dampers?
2016:32 CAM-1	on.
2016:34 CAM-2	wrong answer checked.
2016:35 CAM-1	checked.
2016:37 CAM-2	right here don't roll out start rollin' out you're beside the line.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2016:43 CAM-3	seat belt shoulder harnesses?
2016:44 CAM-1	checked.
2016:51 CAM-1	okay gentlemen standard TWA crew coordination you call out eighty Vee one Vee R please.
2016:58 CAM-2	that's the first officers -.
2017:00 CAM-1	we're going to fly headings, huh.
2017:02 CAM-2	I say that's standard first officer duties.
2017:06 CAM-1	well.
2017:07 CAM-3	taxi checklist is complete.
2017:08 CAM-1	two hundred five degree on the heading five thousand.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2017:10 CAM-2	that's it.
2017:28 CAM-1	position and hold two two right.
2017:31 CAM-1	will you alert the cabin please.
2017:40 CAM-3	flight attendants please be seated for takeoff.
2017:55 CAM-4	****.
2018:03 CAM-2	now that's better.
2018:04 CAM-3	now it's coming on *.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2017:18 TWR	TWA eight hundred heavy caution wake turbulence from a seven fifty seven runway two two right taxi into position and hold.
2017:24 RDO-2	TWA's eight hundred heavy lifeguard position and hold two two right.

INTRA-COCKPIT COMMUNICATION

TIME and
SOURCE

CONTENT

2018:06
CAM-1 I'll just extend it out to that line.

2018:07
CAM-3 * sure *.

2018:09
CAM-2 yeah that's one of the ways you test yourself too is whether when
you get rolled out is the whole airplane longitudinally lined up.

2018:15
CAM-1 yeah.

AIR-GROUND COMMUNICATION

TIME and
SOURCE

CONTENT

2018:21
TWR TWA eight hundred heavy lifeguard wind's two four zero at eight
runway two two right cleared for takeoff.

2018:27
RDO-2 TWA's eight hundred heavy lifeguard cleared for takeoff two two
right.

2018:31
CAM-1 before takeoff checklist.

2018:33
CAM-3 before takeoff checklist. icing considerations?

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2018:34 CAM-1	checked.
2018:35 CAM-3	cabin alert?
2018:36 CAM-1	checked.
2018:36 CAM-3	transponder?
2018:37 CAM-1	that's checked.
2018:39 CAM-3	ignition?
2018:40 CAM	((sound of click)).
2018:41 CAM-1	flight start.
2018:42 CAM-3	body gear steering?

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2018:43 CAM-1	disarmed.
2018:44 CAM-2	clocks.
2018:46 CAM-3	before takeoff checklist is complete.
2018:48 CAM-1	thank you.
2018:49 CAM-4	get right up in there.
2018:51 CAM	((sound of increasing engine noise)).
2018:59 CAM-1	trim throttles.
2019:14 CAM-2	eighty knots.
2019:23 CAM-2	Vee one.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
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INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2019:35 CAM-2	Vee R.
2019:41 CAM	((sound of two clicks)).
2019:43 CAM-1	gear up.
2019:44 CAM-2	gear up.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2020:00 TWR	TWA eight hundred heavy contact New York departure one three five point niner good evening.
2020:05 RDO-2	TWA's eight hundred heavy good night.
2020:14 RDO-2	Kennedy departure TWA's eight hundred heavy lifeguard leaving nine hundred climbing five thousand.
2020:19 DEP	lifeguard TWA eight hundred heavy New York departure radar contact climb and maintain one one thousand.
2020:24 RDO-2	TWA's eight hundred heavy climb and maintain one one thousand.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2020:29 CAM-1	climb to one one thousand and maintain.
2020:47 CAM-1	left to one five zero.
2020:51 CAM-1	flaps five.
2020:53 CAM-2	flaps five.
2021:11 CAM-1	flaps one.
2021:12 CAM-2	flaps one.
2021:26 CAM-1	flaps up.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2020:44 DEP	TWA eight hundred heavy turn left heading one five zero.
2020:48 RDO-2	TWA's eight hundred heavy turn left heading one five zero.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2021:29 CAM-2	say what?
2021:29 CAM-1	flaps up.
2021:30 CAM-2	flaps up.
2021:48 CAM-1	climb thrust.
2022:11 CAM-1	left zero seven zero.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2022:01 DEP	TWA lifeguard TWA eight hundred heavy turn left heading zero seven zero.
2022:07 RDO-2	TWA's lifeguard eight hundred heavy turn left heading zero seven zero.
2022:29 DEP	TWA eight hundred heavy or lifeguard TWA eight hundred heavy turn left heading zero five zero vector climbin' around traffic.

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE

CONTENT

2022:41
CAM-1 left zero five zero climb vector.

2022:58
CAM-1 he's at three o'clock?

2023:00
CAM-2 yeah.

2023:02
CAM-2 that's the problem.

AIR-GROUND COMMUNICATION

TIME and SOURCE

CONTENT

2022:35
RDO-2 TWA's eight hundred heavy turn left heading zero five zero.

2022:44
DEP TWA eight hundred heavy the traffic in the turn will be three o'clock and five miles northeast bound four thousand nor- is a company seven two five five in trail will be a Saab-Fairchild when you're out of five I'll have on course.

2022:54
RDO-2 TWA's eight hundred heavy understand.

2023:19
DEP TWA eight hundred heavy direct Betty resume own navigation.

2023:22
RDO-2 TWA's eight hundred heavy direct Betty own navigation.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2023:26
CAM-1 direct Betty and our own nav.

2019:52
CAM-1 that's alive.

2023:38
CAM-2 huh.

2023:39
CAM-1 direct Betty. correct?

2024:00
CAM-1 *.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2023:37
DEP TWA lifeguard TWA eight hundred heavy contact Boston one three two point three.

2023:42
RDO-2 TWA's eight hundred heavy ah say again the frequency.

2023:44
DEP one three two point three.

2023:46
RDO-2 TWA's eight hundred heavy good day.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2024:01 CAM	((sound of noise of recording tape)).
2024:30 CAM-1	seems like a home sick angel here (*awesome).
2024:36 CAM-2	it's bleeding off airspeed that's why.
2024:38 CAM-1	yeah *.
2024:57 CAM-1	climb and maintain one three thousand.

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2024:41.7 RDO-2	New York center TWA's lifeguard eight hundred heavy eight thousand two hundred climbing one one thousand.
2024:48 CTR	TWA eight hundred Boston center roger climb and maintain one three thousand.
2024:53.4 RDO-2	TWA's eight hundred heavy climb and maintain one three thousand.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2025:53
CAM-1 climb to one nine zero expedite through one five thousand.

2025:57
CAM-3 pressurization checks.

2025:59
CAM-3 (takeoff) thrust go on cross feed?

2026:02
CAM-? ah.

2026:04
CAM-1 yeah.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2025:31
CTR TWA eight hundred what's your rate of climb?

2025:34.5
RDO-2 TWA's eight hundred heavy ah about two thousand feet a minute here until accelerating out of ten thousand.

2025:41
CTR roger sir climb and maintain flight level one niner zero and expedite through fifteen.

2025:47.1
RDO-2 TWA's eight hundred heavy climb and maintain one niner zero and expedite through one five thousand.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2026:07
CAM-3 I'll leave that on for just a little bit.

2026:12
CAM-3 is that right?

2026:13
CAM-4 yes.

2026:29
CAM-1 thirteen thousand.

2026:35
CAM-1 stop climb at one three thousand.

2026:51
CAM-1 *.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT

2026:24
CTR TWA eight hundred amend the altitude maintain ah one three thousand thirteen thousand only for now.

2026:30.3
RDO-2 TWA's eight hundred heavy okay stop climb at one three thousand.

INTRA-COCKPIT COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2026:59 CAM-2	twelve for thirteen.
2027:35 CAM	((sound of click)).
2027:47 CAM	((sound of altitude alert tone)).

AIR-GROUND COMMUNICATION

<u>TIME and SOURCE</u>	<u>CONTENT</u>
2028:13 CTR	TWA eight hundred you have traffic at one o'clock and ah seven miles south bound a thousand foot above you he's ah Beech nineteen hundred.
2028:20.6 RDO-2	TWA's ah eight hundred heavy ah no contact.
2028:22.5 RDO-3	FIC TWA eight hundred.
2028:25 FIC	TWA eight hundred.
2028:25.7 RDO-3	Eight hundred with an off report ah plane number one seven one one nine we're out at zero zero zero two, and we're off at zero zero one nine, fuel one seven nine decimal zero, estimating Charles De' Gaul at zero six two eight.

INTRA-COCKPIT COMMUNICATION**TIME and
SOURCE****CONTENT**

2029:15
CAM-1 look at that crazy fuel flow indicator there on number four.

2029:23
CAM-1 see that.

2029:35
CAM-1 some where in here I better trim this thing (in/up).

2029:39
CAM-2 huh?

2029:39
CAM-1 some place in here I better find out where this thing's trimmed.

2030:18
CAM-1 climb thrust.

AIR-GROUND COMMUNICATION**TIME and
SOURCE****CONTENT**

2028:42
FIC TWA eight eight hundred got it all.

2028:44.8
RDO-3 Thank you.

2030:15
CTR TWA eight hundred climb and maintain one five thousand.

INTRA-COCKPIT COMMUNICATION**TIME and
SOURCE****CONTENT**

2030:24
CAM-1 Ollie.

2030:24
CAM-3 huh.

2030:25
CAM-1 climb thrust.

2030:28
CAM-1 climb to one five thousand.

2030:35
CAM-3 power's set.

2030:42
CAM ((sound similar to a mechanical movement in cockpit))

2031:03
CAM *.

2031:05
CAM ((sounds similar to recording tape damage noise)).

AIR-GROUND COMMUNICATION**TIME and
SOURCE****CONTENT**

2030:19.2
RDO-2 TWA's eight hundred heavy climb and maintain one five thousand leaving one three thousand.

INTRA-COCKPIT COMMUNICATION

**TIME and
SOURCE**

CONTENT

2031:12
end of recording.

AIR-GROUND COMMUNICATION

**TIME and
SOURCE**

CONTENT